

COMPARISON OF *BYBLIS* ‘GOLIATH’ (*B. FILIFOLIA*),
BYBLIS ‘DAVID’ (*B. LINIFLORA*), AND THEIR
PUTATIVE FERTILE HYBRID

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Abstract

Seed derived plants from the cultivars, *Byblis* ‘Goliath’ (Barnes 2009) and *Byblis* ‘David’ (Barnes 2010) were cross pollinated. While the *Byblis* ‘Goliath’ needs buzz-pollination to release pollen, the hybrid between these two taxa develops self-pollinating flowers, like its robust *B. liniflora* parent. This paper is a study of these cross pollination events and its results.

Introduction

A strongly branching plant of *Byblis filifolia* ‘Goliath’ (Barnes 2009) and the self-pollinating *Byblis liniflora* ‘David’ (Barnes 2010, similar varieties have been common in German CP-collections since the mid 1980s) were cross pollinated. While the mother plant *B. ‘Goliath’* needs buzz-pollination to release pollen, the supposed hybrid (see Figs. 1 and 2) develops self-pollinating, obviously very fecund flowers, like its male ancestor *B. ‘David’*. This paper is a comparative study of the three plants.

Settings and experiment

Both parental plants (P-generation) grow side by side in our tropical greenhouse in Weil am Rhein (Germany). They receive full sunlight (southwestern exposure) and get only de-ionized water. The summer temperatures vary around 24–36°C during daytime (winter = 15–26°C) and between 16–24°C during nighttimes (winter = 12–15°C). During winter additional HQI-lighting and heating is provided. At the time of pollination no other *Byblis* species have been present in our collection; therefore any other accidental cross-pollination can be excluded with certainty.

Since the mid 1980s, the small self-pollinating variety of *B. liniflora* has been part of our collection. The richly produced seeds remain fertile for several years, so it’s no problem to keep the cultivation pattern going even over decades. With our conditions, individual plants survived up to two years, but they are annual in the wild, due to seasonal droughts. Without cutting the tip or injuring the stem, during more than 25 years this variety never developed any branches under our growing conditions. The species remains relatively small and rarely exceeds 18–20 cm height. We produced two time-lapse videos of our plants to demonstrate the leaf-movement by pulvinus (Hartmeyer & Hartmeyer 2010).

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Figure 1: *Byblis* cf. *filifolia* × *liniflora* dried plant showing branching pattern and general habit. Photo by S. Hartmeyer.

Brian Barnes (Barnes 2010) described a larger growing form of *Byblis liniflora*, as *Byblis* 'David' (see Fig. 3) also a self-pollinating plant. The seed for this selected cultivar was obtained from Rarexoticseeds in Canada.



Figure 2: *Byblis* cf. *filifolia* × *liniflora* details. Photo by S. Hartmeyer.

For many years we have also been growing a large *B. filifolia* from the Eastern Kimberley region, which needs buzz-pollination to release pollen. Holding the tip of an electrical tooth brush (without brush) close to the flower, while keeping a sheet of paper below, is a very easy and effective way to harvest pollen. However, a second and genetically different plant is necessary for successful pollination and seed production, as *B. filifolia* is self-sterile.

Byblis ‘Goliath’ is a robust cultivar of *B. filifolia* described by Brian Barnes (Barnes 2009, see Fig. 4).

In spring 2010, Brian Barnes asked us to grow and compare his cultivar *Byblis* ‘Goliath’ with plants grown from seeds labelled *Byblis guehoi* (ex CPUK seed bank), and to report the movement of leaves in the genus by pulvini which Brian found out and published first (Barnes 2009), on video. Sown in March 2010 after a treatment with 0.1% Gibberellic acid for 24 hours, seeds of both plants germinated within 5–7 days, which is actually fast. Both plants grew with the same speed, branching strongly from the beginning and starting flowering after about 6–7 weeks. All plants including the small *B. liniflora* possess pulvini for the movement of leaves and pedicels.

We grew about 10 plants from each seed pack, so the pollination of the self-fertile species was no problem. But only *Byblis* ‘Goliath’ produced healthy seed pods (pollen released with a tooth brush) during the whole season, the other plants from seeds labelled *B. guehoi* (ex CPUK seed bank) proved to be totally sterile. This was the only, but interesting difference we observed between the plants. Even the typical bright yellow anthers showed an identical single brown structure, which varies in number with different *Byblis* taxa and may even be totally absent. In our



Figure 3: *Byblis* 'David' details. Photo by S. Hartmeyer.

opinion both plants appear to be very closely related, extremely branching varieties of *B. filifolia*, one fertile and one infertile.

Considering possible cross-pollination that may result in partly fertile hybrids, it cannot be excluded with certainty that large and extreme branching plants like our *Byblis* 'Goliath' are indeed the result of former unnoticed hybridization in a greenhouse or even in nature.

In autumn 2010, we pollinated two *Byblis* 'Goliath' flowers, dipping a flower of *Byblis* 'David' on them. A pot with *Drosera ultramafica* was standing beneath the flowers. Unfortunately we missed the moment when the seed pods opened and were therefore happily surprised when we found (after our return from a USA CP-trip in May 2011) healthy seedlings growing in that pot with *D. ultramafica*. Five of seven plants developed homogeneously very fast. Two plants remained small and unbranched unlike the large parent species. These could have been seedlings of selfed *B. liniflora* and were therefore not included in the measurements for Table 1.

While the growing shape appears like an airy form of *Byblis* 'Goliath', the flowers are self-pollinating, looking like those of the smaller *Byblis* 'David'. Self-pollination takes place in the afternoon and we were able to document that with our USB-microscope. Almost every flower of these apparent F1-hybrids (see Fig. 5) automatically produced a seed pod containing lots of healthy seeds, which ripen fast and germinate without any treatment (GA3, etc.) within only 7–9 days. Twenty one of these F2 generation plants thrive and are now 20–45 mm high. These F2 plants needed some more weeks to flower at the time of writing, but it will be very interesting to



Figure 4: *Byblis* 'Goliath' details. Photo by S.Hartmeyer.

see what variation of growing shapes, pollination-type, branching and size of flowers and seed pods will appear.

To verify if the described hybridization is reproducible, we repeated the cross-pollination experiment at our greenhouse in early August 2011, using this year's generation of *Byblis* 'David' and

Character	<i>Byblis</i> 'David'	<i>Byblis</i> cf. <i>filifolia</i> × <i>liniflora</i>	<i>Byblis</i> 'Goliath'
Largest flowers*	12–15 mm	20 mm	27 mm
Seed pods	4–5 mm	5–6 mm	10 mm
Longest leaves	50 mm	70 mm	50–70 mm**
Pedicel	45 mm	55 mm	60–95 mm**
Branching	No	5–9	> 10

* *Byblis* 'Goliath' and *Byblis* cf. *filifolia* × *liniflora* also partly produce clearly smaller flowers (while the flower size of *B. liniflora* is relatively constant), therefore we took only the size of the largest flowers for comparison.

** Our one-year-old *B.* 'Goliath' plant is still flowering, but now with mainly creeping branches, it usually develops only very short leaves (mainly approx. 40 mm), much shorter than during the erect growth in the first 6 months. Also the pedicels are now mainly 60–70 mm long.



Figure 5: *Byblis* cf. *filifolia* × *liniflora* mature plant with maturing seedpods. Photo by S. Hartmeyer.

Byblis ‘Goliath’, grown from seeds of the P-generation (2010). Six days later the first pollinated flower showed a clearly swollen ovary and after 10 days a healthy developing seed pod was visible. After 20 days the seed pod opened at a size of 5 mm diameter, and released four healthy looking and three undersized seeds. Also a second of three cross-pollinated flowers showed a swollen ovary at the beginning, but withered after two weeks because the pedicel had been damaged below the sepals, probably during pollination. This single (it was the only *Byblis* ‘Goliath’ plant in our collection in 2011) self-sterile plant never produced seed pods without being artificially pollinated either with a *Byblis* ‘David’ flower or with pollen of another *Byblis* ‘Goliath’ plant, harvested by the “electrical tooth brush method”.

The successful repetition of this cross-pollination verifies that interspecific hybrids can be produced artificially in the genus. Considering that meanwhile both parental cultivars exist in many CP-collections and even nurseries, cross-pollination of the parent plants could be a very easy way to establish the showy self-pollinating hybrid in larger quantities in cultivation.

The supposed hybrid appears intermediate between its supposed parents *B.* ‘Goliath’ and *B.* ‘David’ and is self-pollinating and self-fertile. Table 1 shows a comparison of representative measurements of the five homogeneously growing plants (excluded are two non-branching plants of uncertain parentage). The branching pattern is like the maternal *B.* ‘Goliath’ plant, the flowers look like those of *B.* ‘David’.

Discussion

So far the only successful hybridization of *Byblis* has been reported by Brian Barnes in March 2008, crossing the cultivar *Byblis* ‘Goliath’ with *Byblis rorida*, while other authors stated that cross pollination in the genus has never been observed in the wild (A. Lowrie, ICPS Conference Leiden 2010). An internet search for *Byblis* hybrids shows only the mentioned report by Brian Barnes, and a failed experiment to cross *B. gigantea* with *B. filifolia*. Stewart McPherson reports (McPherson 2010, page 972): “No naturally occurring *Byblis* hybrids have been recorded with certainty.”

However, the successful interspecific cross pollination under greenhouse conditions should encourage field researchers to now look particularly for natural *Byblis* hybrids in tropical Australia, where different species are sympatric. If fertile hybrids occurred also in the wild, the identification of taxa could be complicated by back crossing, comparable to the situation in some taxa of *Nepenthes* and *Sarracenia*, where hybrids occur commonly in the field.

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